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PRELIMINARY STUDY OF THE EFFECT OF DENTAL TREATMENT UPON THE PHYSICAL AND MENTAL EFFICIENCY OF SCHOOL CHILDREN.

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INTRODUCTORY.

Studies concerning the loss of efficiency due to defective vision, impaired hearing, presence of adenoids, etc., have been made by Dr. Leonard Ayres, Dr. Walter C. Cornell and others. Last year Dr. J. E. Wallin made an attempt to "measure the relation between community mouth hygiene and intellectual efficiency of elementary school-children." This work was done in the city of Cleveland, and very promising results were claimed. The weak point in the work there, as is conceded by the experimenter, is the fact that only the class of children receiving dental attention was tested, thus giving no opportunity for comparison with other children not receiving treatment. The present paper is a first attempt to trace the effect of dental treatment with proper check-tests of non-treated children.

THE METHOD.

Two fifth grade classes in the same down-town school were selected for the purpose of comparison. The classes were as evenly graded as is possible in ordinary school classification. Both were so-called German-English classes; that is, each gave a part of the day to the study of the German language. The

children came from the same neighborhood, so that home and social conditions were largely the same. A census showed that in one class (Room 21) there were 16 children who were themselves foreign born and whose parents were foreign born, while 13 children were American born with foreign born parents. In the other class (Room 18) 21 children were foreign born with parents of foreign birth, and 13 were American born with foreign born parents. In all but three of the above cases the places of birth were Russia, Austria, Servia and Hungary. The home conditions were thus more than usually of like kind.

The choice of the experimental class was decided by the toss of a coin. Room 21 was chosen. The classes were about equal in numbers, starting out exactly so, and the proportion of boys and girls in each was the same.

Room 21 received all the care that dental science could give, including treatment, tooth-brush drills, dinners to afford opportunity to teach proper mastication, etc. The other class received only such attention as they sought, which was found to be practically none. A nurse and social visitor followed all experimental cases and saw that instructions were carefully heeded.

The Tests in Detail.

The physical tests included weight and height standing, and were made by the physical director of the school. All other tests were given by the same two experimenters, each taking certain ones.

The Psycho-physical Test. Here we used the Tapping Test (Test 10, Whipple's *Manual*); a tapping board with brass plates, a tapping stylus and a recording instrument, which showed the number of contacts made, were used. By means of a stop-watch the number of contacts was read at the end of each 15 seconds. The test for each hand extended over a period of one minute. The experimenter explained the manner of procedure by going partly through the test. The subject was then placed in position and given a few seconds' practice, followed by a rest. It was insisted that all movement be from the wrist, so as to secure more uniformity. At the beginning the subject was urged to do his best, but nothing was said during the work.

The Psychological Tests. I. The "A" Test (Whipple's Test 26). This is the familiar Cancellation Test. The subject is given a sheet of paper on which the letters of the alphabet appear in chance order and is told to cross out all of a certain letter as quickly as possible, line by line, without going back for corrections or omissions. On the sheet used each letter appeared 50 times. This test was given to a group, half the class being taken at a time and distributed through the room to avoid copying. A sample copy was explained from the blackboard, after which the test papers were placed on the desks, face down. Each child wrote his name on this reverse side. At an agreed signal, the papers were turned from left to right and work begun. A warning was given in advance not to sacrifice accuracy for speed. The time allowed was 150 seconds, and all hands were clasped on the heads at the close of the exercise while the papers were collected.

In May a similar sheet was used, but the letter crossed was "m."

II. The Rote Memory Tests. We used the Memory Span Method (Whipple's Test 38), by the group method. The test was explained by the use of a card on which appeared five discrete digits. A metronome was set at 60, and the class allowed to catch the rhythm. The card was then exposed and the class read the digits aloud, in time with the metronome beats. At the signal the digits were written on paper provided for the purpose. Attention had been called to the importance of recording the digits in the original order. After this practice, two cards each of 6, 7, and 8 digits were exposed and the papers collected as before.

III. The Learning Test. Substitution (Whipple's Test 37). This test seeks to measure the rapidity with which associations are formed by repetition. A piece of cardboard on which were printed nine simple geometrical forms (square, triangle, etc.) with an inscribed digit in each was used as a "key." This key was presented to the subject in connection with four sheets of paper each containing ten lines, five of the above symbols, arranged by chance, to each line and without the inscribed digits. The subject was requested to inscribe the proper digits, line by line. He was allowed to use the key for

the first three sheets, but not for the last one. Each line as completed was covered by the experimenter.

In the tests given in May the same symbols were used, save that different digits were assigned to them; moreover several different keys were put in use at the same time, and the children were informed of this, so that there might be no temptation to communicate when they returned to their classrooms.

The Results.

In all the figures given below, the median is used rather than the more common average, as it gives the central tendency of the class and neutralizes the effect of extremes at either end.

Only such children as were present in both groups of tests are counted; otherwise there has been no selection.

I. Weight.

Physical Tests.	*Oct.*	*May.*	*Gain.*
Room 18. 38 cases	67.5 lbs.	76.5	9.
Room 21. 40 cases	67.25 lbs.	73.	5.75

Here we find that while the median for the two classes was almost identical, in October Room 18 leads in gain by 3.25 lbs.

II. Height Standing.

Physical Tests.	*Oct.*	*May.*	*Gain.*
Room 18. 39 cases	53.2 in.	56.1	2.9
Room 21. 40 cases	53.5 in.	56.	2.5

The measurements here show no appreciable difference.

The Psycho-physical Test. In evaluating the results of this test we have taken into account the actual number of taps at each trial (marked "total"), and also the "fatigue element." The *fatigue index* is a per cent, which shows the ratio between the decrease in the number of taps during the last 15 seconds and the total number in the first 15 seconds (the tapping continued 60 seconds in all.) Results are given for each hand, one trial each. It will be noted that the total number of taps is significant, since it is likely that the fatigue-index will be less when the initial total is small. For example: Subject S. L. has the following record: 77-75-73-73; total 298; fatigue index 0.051.

Subject J. G. has the following record: 111-101-103-87; total 402; fatigue index 0.216.

Here, Subject S. L., with an initial speed of 77 taps, has a

fatigue index of only 5%, while Subject J. G., with 111 taps, has an index of 21%; yet the latter, with his total of 402 taps, has surely the better record, especially since the taps in the last 15 seconds exceed by 10 taps those of the first 15 seconds in the other subject's record.

Right Hand, Total Taps.	*Oct.*	*May.*	*Gain.*
Room 18. 41 cases	295	308	13.
Room 21. 41 cases	304	312	8.

Room 21 leads in both tests by 9 and 4 taps respectively.

Left Hand, Total Taps.	*Oct.*	*May.*	*Gain.*
Room 18	242	253	11.
Room 21	243	255	12.

Room 21 leads in both tests by 1 and 2 taps, respectively.

In computing the fatigue-index we found that sometimes there were more taps in the last than in the first 15-second period, which shows lack of proper effort on the part of the subject. There were 4 such cases in Room 18 and 1 in Room 21.

Fatigue-index, Right Hand.	*Oct.*	*May.*	*Gain.*
Room 18. 41 cases	15.2%	13.1%	2.1%
Room 18. 41 cases, without minus cases	14.5%	13.3%	1.2%
Room 21. 41 cases	17. %	12.5%	4.5%
Room 21. 41 cases, without minus cases	17. %	12.5%	4.5%

Although Room 21 shows greater fatigue in the first test by 1.8%, it shows less by .6% the second time, thus placing its endurance in the lead by 2.4%.

Fatigue-index, Left Hand.	*Oct.*	*May.*	*Gain.*
Room 18. 41 cases	15.1%	14. %	1.1%
Room 18. 41 cases, without minus cases	15.0%	13.6%	1.4%
Room 21. 42 cases	17.5%	13.5%	4. %
Room 21. 42 cases, without minus cases	17.5%	13.3%	4.2%

As with the right hand, although Room 21 shows greater fatigue in the early test, it shows .5% less in the second, and thus shows a gain in endurance of 2.9% over Room 18. As pointed out above, the fact that Room 21 leads in every case in total number of taps makes the lead in endurance the more conspicuous.

Psychical Tests. I. The Cancellation Test.

This is a test in perception, and is scored by the number of letters cancelled in a fixed time. In this case the time was 2½ minutes. The results are given in simple percents, which indicate the accuracy of the performance; the time is constant.

Cancellation Test.	*Oct.*	*May.*	*Gain.*
Room 18. 40 cases	61 %	84 %	23%
Room 21. 37 cases	56.5%	74.5%	18%

Here Room 18 takes the lead; 5% in the lead in the beginning, it gains in the second test, making a total gain of 5% more than that of Room 21.

In looking over the individual records we find that the time-limit seemed to interfere greatly in Room 21. The work done there is accurate, but in most cases the papers were unfinished when time was called and the score was thus reduced, as it was based on the crossing out of the complete number of "a's."

II. The Rote Memory Test.—The evaluation of results is again in percents, credit being given both for the reproduction of the digits and for the order of their reproduction. Two cards of each series were used, and the average of the two results is taken in the table. A correct digit properly placed received 4; if one place removed from the proper place it received 2; no other credit is given, except in case of a series of three digits in correct succession but wrongly placed, when only the first of the series lost its credit. In this way, when there were six digits in the series, 24 represented a perfect record of 100%, and others were calculated accordingly.

Rote Memory, Six Digit Series.	*Oct.*	*May.*	*Gain.*
Room 18. 40 cases.	87.5%	96.6%	9.1%
Room 21. 38 cases.	91.6%	100 %	8.4%

Room 21 leads at the beginning by 4.1% and at the second test by 3.4%. Its median of 100% makes it impossible to show a greater gain. This is evidently too easy a test for children of this age.

Rote Memory, Seven Digit Series.	*Oct.*	*May.*	*Gain.*
Room 18.	71.4%	71.4%	0 %
Room 21.	74.9%	85.7%	10.8%

Room 21 leads at the beginning by 3.5% and by 14.3% in the second group, finishing with a gain of 10.8% over its first record as against no gain in the other class.

Rote Memory, Eight Digit Series.	*Oct.*	*May.*	*Gain.*
Room 18.	56.3%	62.5%	6.2%
Room 21.	59.3%	65.6%	6.3%

Room 21 leads in the first group by 3%, in the second by 3.1% and in gain by .1%. We here reach the limit of memory span for this age and the possibility of gain is therefore less.

III. The Learning Test. Substitution.

The results are based on the percents in accuracy and time in seconds and represent the amount of time necessary to approximate 100% in accuracy. There are 50 symbols on a page; each one correctly inscribed receives 2. The time, in seconds, taken for the work is noted. The index of efficiency is then obtained by dividing the time thus expressed by the per cent of accuracy. By multiplying this index by 100 we get the amount of time needed to approximate 100%. For example:

Subject I. J. shows the following record for the first sheet:

Time.	*% of Accuracy.*	*Index of Eff.*
186.4″	96%	1.941

Multiplying the index by 100 we find it would take this subject 194.1 sec. to approximate 100%. The tables below give the results for the first and last sheets only as they alone are necessary to calculate the learning power.

Substitution, Sheet I.	*Oct.*	*May.*	*Gain.*
Room 18. 43 cases.	201.6″	172″	29.6″
Room 21. 38 cases.	206.5″	183″	23.5″

As indicated above, the figures show that in the first test Room 18 needed 201.6″ to reach a perfect record in the first, and 172″ in the later test. Similarly, Room 21 needed 206.5″ in the first and 183″ in the second test. Room 18 shows the better record.

Substitution, Sheet IV.	*Oct.*	*May.*	*Gain.*
Room 18. 43 cases.	118.8″	110.5″	8.3″
Room 21. 38 cases.	127.4″	104.9″	22.5″

It will be remembered that in Sheet IV the work was done without reference to the key, and thus indicates the learning power.

In this test Room 18 needs 118.5″ in the first, 110.5″ in the second trial, making a gain of 8.3″. Room 21, although needing 127.4″ in the first trial, reduces this to 104.9″, making a gain of 22.5″.

The real values in the above test are shown in the next table which gives the "learning power;" *i. e.*, the saving in time between that needed for the first sheet the first time and that needed for the last sheet the last time.

Learning Power.	*Sheet I, 1st time.*	*Sheet IV, last time.*	*Gain.*
Room 18.	201.6″	110.5″	91.1″
Room 21.	206.5″	104.9″	101.6″

Room 21 leads, with a learning power expressed by a saving of 101.6″, compared with 91.1″ in Room 18.

Conclusions.

In summarizing we find that there is a decided lead taken by the Experimental Class. This holds true in all but one of the psychological tests. The improvement in appearance and deportment in the experimental class has been marked by the numerous educational and social workers who have visited the school during the year. To make the comparisons more valid we have planned to follow these classes for another year, submitting each to a new series of tests at the beginning and close of the school year. The disturbing factor introduced by the actual carrying on of the dental work in the experimental class, which we feel was to a degree adversely involved this year, will be slight, since the original timidity has been overcome and but little treatment will be needed to keep up the present good oral conditions.

In the following tabulation we have sought to show at a glance which group led, on the average for each test, save the physical, both before and after the dental treatment:

	Room showing net superiority	
Test.	*Before dental treatment.*	*After dental treatment.*
Total taps, right hand	21	21
Total taps, left hand	21	21
Endurance, tapping, right hand	18	21
Endurance, tapping, left hand	18	21
Rote memory, 6 digits	21	21
Rote memory, 7 digits	21	21
Rote memory, 8 digits	21	21
Cancellation	18	18
Substitution	18	21
Learning	18	21

In all, then, Room 18 led five times out of a possible ten when the tests were given first, so that its ability would seem to be equal with that of the treated class. After dental treatment of its competitor, Room 18 leads but once, while Room 21 maintains its previous lead in five tests and gains the lead in four of the five remaining tests, finishing with a total of nine out of a possible ten.

EXPERIMENTAL RESEARCHES ON LEARNING TO SPELL.

By W. H. Winch.

London, England.

(Concluded from the November Number.)

Part II.

V. A Second Experiment, with Standard IV. Boys.

Average Age 11 years 0 months.

i. *The Boys who did the Work, and why it was done with older Boys.*

In the first experiment we found that, with boys who were young and mentally undeveloped, a method of learning spelling, which, with attention directed by the experimenter, possessed marked articulatory and auditory factors as well as visual ones, was superior in results to a method in which the boys worked silently by themselves, and therefore apprehended the sequence of the letters mainly by visual means. I say *mainly* by visual means, since, as a matter of fact, the boys also muttered the words and letters as they were learning them. With young children of an undeveloped type it is practically impossible to prevent this. So that it might fairly be argued that by *both* methods the children really employed articulatory and auditory factors, as well as visual ones. But older boys can really work silently, or at least, much more so. Perhaps *really* silent visual work would be more efficacious than simultaneous work by a combined method. To test this hypothesis a similar experiment was carried out with the boys of Standard IV[1]—the highest class in this school which contains, as an American would say, the primary, but not the grammar grades. As before, the boys who did the work were exclusively the children of Jewish aliens.

[1] This Standard corresponds to Grade V in America and to the Fifth School Year in Germany.

ii. *The Lists of Words of Equal Difficulty.*

Two sets of words were selected, 30 in each set, from a small dictionary called '*Green's Dictionary of Selected Words, being the words added to a Scholar's Vocabulary in the Upper Standards of an Elementary School.*' The title is unduly hopeful, and I am not prepared to advocate that every one of the words in these lists should be known by all elementary pupils; but that non-advocacy will in no way invalidate the conclusions of our experiments. The following words were picked out:

The List of Words called Set A.		*The List of Words called Set B.*	
aborigines	exchequer	accomplice	excavate
acrobat	extinguish	acquit	extravagant
advertisement	disease	apprentice	eccentric
aeronaut	eclipse	aggravate	economy
alibi	committee	almanac	complexion
amateur	conciliate	ambassador	conceal
analyze	congestion	annuity	conjurer
apostrophe	conscience	apparition	convalescent
apprehend	convulsion	archipelago	correspond
arsenal	corroborate	artificer	crucible
asphalt	denominator	auxiliary	deteriorate
bachelor	destitute	bazaar	dislocate
blaspheme	dispensary	bronchitis	discipline
campaign	duplicate	carnivorous	ecclesiastic
chronometer	effervesce	chrysalis	encyclopedia

I print these lists, since they have been tested and found equal, for one class at least; and they may be useful to other experimenters.

iii. *How the Test Words were Administered.*

They were called out by the experimenter—the Head Master, as before—each word once, and then written down, one by one, in small hand, by the boys taking part in the experiment. Words from Set A and Set B were called out alternately, one from Set A and then one from Set B, and so on. They were dictated at 2.15 p. m., after the second Registration on Monday, February 17th, the exercise taking 25 minutes. For the present I ask the reader to accept the equality in difficulty of the two sets of words—the detailed results will be given later.

iv. *The Chronology of the Teaching Practice for Set A and Set B.*

Each lesson lasted 10 minutes, and commenced either at 9.45 in the mornings, after Scripture lesson, or at 2.05 in the afternoons, after the first Registration. The words of Set A were learnt on the Tuesday morning following the preliminary test, on Wednesday afternoon, and on Thursday morning. Those of Set B were learnt on Tuesday afternoon, on Wednesday morning, and on Thursday afternoon. East set of words, therefore, received three practice periods of 10 minutes each. Set A probably has a slight advantage in point of time for work of this kind; though, for work employing what are usually called the 'higher mental functions,' the early afternoon is probably better. But if any advantage exists, it is certainly a very slight one.

v. *The Two Methods Employed, one for Set A, the other for Set B.*

The method for Set A was precisely the same as that employed for Set A in the previous experiment in the same school; it was a combined method with directed attention. For Set B the method was, as before, a visual method without directed attention. All the testing and teaching were done by the same man throughout—the Head Master of the school. This is important with experimental work with children, since, to alter your experimenter as well as your method, is to run grave risks that a new factor, producing variation, may come in, to wit, the disciplinary influence of the experimenter. Sometimes this risk must be taken, but it should be avoided if possible. The reader is requested to refer to the account of the previous experiment for a psychological analysis of the two methods: these boys did not mutter; the method for Set B was, therefore, really visual, and visual only.

vi. *The Final Tests with Set A and Set B.*

On Monday, at 2.05 p. m., the two Lists of Words were dictated, word by word, one word from each set alternately. Set B, therefore, in the final testing, had the slight advantage of a more habitual time to set against the slight advantage of the larger number of *morning* lessons accredited to Set A.

vii. *The Results in (a) The Preliminary Tests, (b) The Final Tests.*

The complete results for each individual were tabulated and entered on a schedule. I suggest the general utility of such schedules in experimental pedagogy; they will save us from many hasty conclusions, and are of enormous interest to the teachers. Give a teacher such a schedule, with marks that he can understand, set out for the boys he knows (the psychologist doesn't, let us remember) and he will thank you and ask you to do some more work in his school. The teachers who know the boys will discuss the results most eagerly; they will tell you that you are wrong in certain cases—you probably are—but that will not prevent them (and they know, if anyone does, the variability of school-children) from frankly accepting the general results of the experiment, if they are set out in a form which they understand. The more sophisticated teachers are suspicious of mathematical calculations: the superior person, arguing from data by methods they do not know, will *never* convince *them*. I am not prepared wholly to condemn their attitude: I like to see individual results myself.

Table III, showing how the Individual Results were tabulated.

Name.	Tests before Learning Number of Words Correct. Set A.	Set B.	Tests after Learning Number of Words Correct. Set A.	Set B.
M. Marks	15	15	28	26
A. Dorin	13	10	24	19
..	..	..	..	..
A. Roth	9	11	30	27
..	..	..	..	..
P. Müller	7	6	24	24
..	..	..	..	..
H. Ritts	3	3	23	22
S. Altman	3	3	24	19
..	..	..	..	..
M. Serkner	0	0	1	1
..	..	..	..	..
H. Woolfstein	0	0	12	5
54 boys. Averages	4.3	4.4	17.9	15.1

Comments on Table III.

Apparently the words for Set A and Set B were well chosen: they are equally well done *before* learning. There has been enormous improvement *after* learning: and reference to the full schedule of results shows that there are only three cases

in which the improvement by the method employed for Set B is greater than that resulting from the method employed for Set A. A grouped correlation table follows.

Table IV., showing, section by section, the Number of Words Spelt Correctly before Learning and after Learning.

Number of Words of Set A Correct before learning.	No. of boys.	Before Learning. Average number right.		After Learning. Average number right.	
		Set A.	Set B.	Set A.	Set B.
Over 10.	3	13.0	12.0	26.3	24.3
9, 8.	8	8.5	8.5	24.5	22.7
7, 6.	8	6.9	7.1	22.4	18.4
5, 4, 3	14	4.0	4.6	21.4	16.4
2, 1.	10	1.6	2.6	12.3	11.5
0.	11	0.0	0.3	8.7	6.7

Comments on Table IV.

These are evidently not 'chance' results. All along the line, for the weaker pupils as well as for the abler ones, the simultaneous combined method with attention directed by the experimenter has shown itself victorious. To the statistician the result emerges quite as readily and more succinctly from the figures given in the following section:

viii. *Statistical Evaluation of the Result.*

The average number of words correctly spelt in Set A *before* learning was 4.3, for Set B it was 4.4. The correlation coefficient between the results of Set A and Set B was +.81, and the 'probable error' of the difference between the averages was .20. There is, therefore, no 'significant' difference between the two lists before learning.

After learning, the averages were, for Set A, 17.9, and for Set B, 15.1: the correlation-coefficient was +.89, and the 'probable error' of the difference between the averages was .34. The difference between the means, namely, 2.8, is 8 times its 'probable error,' and is therefore a highly 'significant' difference.

ix. *Conclusions from the Second Experiment.*

It was suggested that the presence of slight articulatory and auditory factors in the method used for Set B *might* have lessened somewhat the results by this method with the young children of Standard II. On the other hand it was also sug-

gested that a purely visual method might have a better chance with older children. So far, all that we can say is that with these older boys—about 2⅓ years older—the result is in the same direction as with the younger children, but even more decided. The combined method has again won the victory. But, for there is a but, I am not yet convinced that for all elementary school children the combined method is the best. These boys are still young in years—about 11—and are certainly not of a highly developed type; and we must try the experiment in other schools of a different character. Still, for boys of this age and development, there is no doubt about the results; they are conclusive. But let us bear in mind that for Set B the attention of the boys was not directed, and for Set A it was. The difference may lie there, and not in the combination of motor, auditory and visual memories. But under the conditions given—a method actually in use in schools—the 'combined' method proves to be distinctly superior.

VI. Subsidiary Experiments with Standard I. Boys.

Average age 7 years 0 months.

i. *How the Experiment came into Being.*

I call these exercises now to be described *subsidiary* experiments, though they were more numerous and extended over a much longer period than those which have previously been recounted. But they are really subsidiary in two respects. First of all, they preceded these experiments in time, and secondly, there were imperfections in them, considered experimentally, which render them less conclusive; though, as I have said, they were much more numerous and much more protracted. But collectively they have some value; and they are interesting as showing, in one actual case, how a principal, just appointed to a school, set about trying to improve the spelling; at first, with a fair degree of confidence. They also indicate how he began to realize that he did not really know the best way, and how he asked for guidance in finding out. The school was the 'down East' school in London in which, so far, all the spelling experiments described have taken place. The boys read fairly well, but it was said they spelt very badly.

The boys who did the work were graded as Standard I—a normal group of boys, since the Infants' department contained no class graded as a Standard class.

ii. *The First Method Employed to Improve the Spelling.*

Near the close of every afternoon session, six easy words, whose pronunciation and meaning were known to the boys, were written on the blackboard. The pupils were provided with slips of paper, and they were told to copy the words and learn them at home. The circumstances were not wholly unfavourable for home lessons; since, though the children lived in poor, and, in many cases, in crowded homes, their Jewish parents were keen—unlike so many of our English ones—that their children should learn and so get on in the world. The boys copied the words, but did they all learn them at home? Every morning the teacher of the class dictated the six words that the boys had been instructed to learn the evening previous. On the Monday following the week in which the 30 words had (or had not) been studied—six words had been given for each of five evenings, Monday to Friday inclusive—the Head Master dictated the whole list of 30 words. Teachers will be prone at first to think that a description of such a common experience is hardly worth while. But the value of it lies in the continuance of the method, and the careful tabulation of the results. For twelve weeks this process was repeated, from August 26th to November 15th. No improvement at all took place in the power to acquire fresh spellings in the class as a whole. Of the first 30 words, dictated on September 2nd, an average of 17.0 was spelled correctly; of the last 30 words, dictated on November 18th, the average spelt correctly was 17.0. Thirty per cent. of the class had shown no improvement any where along the series, and those who had improved had done so with many back-slidings.

The time taken averaged ten minutes a day, with an additional twenty minutes for the Head Master's weekly test, making a total of seventy minutes a week of school time for twelve weeks practice which showed practically no improvement. There certainly seemed no "transfer" improvement, the boys did *not* acquire the later sets more thoroughly and expe-

ditiously than the first. But of course they had learnt to spell, or many of them had, a number of words which they did not know before. The Head Master was not satisfied; he knew that, when learning by "good methods," children show steady and continuous improvement. In this case, after twelve weeks work, if they were improving at all, they were only creeping along, and some were not even creeping. And the school time: 70 minutes a week for it; was the result worth it? Wasn't the whole thing a futility?' So he started out again by another method.

iii. *The Second Method Employed to Improve the Spelling.*

Hitherto, it was certain that the boys had copied the words, and had attempted next day to write them down when they were dictated, but whether they had made any visual or other repetitions of them at home was not known. Probably some had and some had not. The method had failed to produce rapid improvement, and it was costly in school time. A start was therefore made by another method on December 2nd. As before, the object was to teach, or require to be learnt, 30 words, whose spelling was, generally speaking, unknown, within one week. The lessons, ten minutes long, were taken at the commencement of every afternoon session, five lessons a week, at 2.05 p. m. The words selected may prove of interest to teachers. They were as follows:

bird	mouse	butterfly	flower	bluebell
sparrow	bear	snake	daisy	fruit
goose	wolf	worm	lily	orange
swan	monkey	wasp	wallflower	pear
gooseberry	carrot	sugar	coffee	wine
turnip	bean	water	cocoa	brother

The words were written on large cards (12 inches by 15 inches), one word on each card. The boys were provided with pens and slips of paper. Each word was shown to the class for 10 seconds. At the commencement of each exposure, the Head Master pronounced the word in a clear loud voice. At the end of the ten seconds the card was removed and the boys were told to write the word down quickly. Twenty seconds were allowed for writing, and the next word was pronounced as before. The boys were instructed to learn the words by looking

at them, but, in actual practice, they muttered the letters as well, whilst they were looking at them; but it was a subdued, and, as it were, a contrary-to-order muttering, which made it rather a surreptitious affair. The first ten of the thirty words were exposed, studied and written from memory, one at a time, within five minutes: in the remaining five minutes of the lesson they were repeated in exactly the same way as before. On the second day the next ten of the thirty words were studied in precisely the same way, and on the next day the third or concluding ten. On the fourth day, twenty skeleton words were placed on the blackboard, for example, ird: s arr w : g se : etc., and the boys were told to complete as many as they could. They liked the exercise, but found it difficult: very few boys completed the whole twenty. On the fifth day the ten remaining words were skeletonized, and also ten of the most difficult in the list. The boys did not work at the completion of them with much success. On the following Monday morning the whole list was dictated. There was an average number of correct spellings amounting to 17.7. "Not a very great advance on the previous method," said the Head Master. "I believe the 'skeleton' words were of little use and I shall discard them." The method was costly in time too, seventy minutes for 30 words. I shall try again."

But some of the weaker boys spelt better than they had ever spelt before.

iv. *The Third Method Employed to Improve the Spelling.*

Once again it was proposed to require 30 words to be learned within a week, to give 10 minutes a day to them, and, as before, to have the work done visually without overt articulatory and auditory factors.

The words selected were as follows:

round	feed	found	jumps	folk
line	uncle	thought	kitten	miss
own	twice	poor	fight	back
lamp	early	bricks	always	frock
pocket	catch	bark	arm	tart
awake	house	candle	night	rock

We did not know how many of these words the boys could spell already, before the special practice; and it is possible

that the boys were by growth and practice at a different slope of their curve, so to speak, this week than last; and these words also may be easier or harder than the last set. Teachers would, I think, say they were easier. It was the consideration of points like this which forced the Head Master to ask for help in framing more conclusive experiments. Still, if this work is corroborative of more exact experiments, it will not be unprofitable to record it.

On Monday, at 2.05 p. m., the first ten of these words were exposed, one at a time, and pronounced by the experimenter as in the second method, twenty seconds being allowed for each word to be written from memory by the boys. This took 5 minutes; the same words were given again in the same way during the remaining 5 minutes of the lesson. On Tuesday the next ten words were studied, and on Wednesday the third and concluding ten. Each word had, so far, been exposed twice and written from memory twice. On Thursday ten of the hardest words in the set were exposed and written twice; and on Friday—the fifth day—ten more of the harder words were dealt with. The twenty harder words had, therefore, been exposed and written from memory four times. There was, on this occasion, no 'skeletonizing' of the words. On the following Monday morning, December 16th, the whole list of 30 words was dictated. The average number correctly spelt was 20.8 and every boy in the class was able to spell *some* words correctly. This looked like a distinct improvement, but the method was costly in time; and was rather complicated. For there were, undoubtedly, some articulatory and auditory factors employed, as well as visual ones, for the boys 'forgot themselves and muttered': and there was a graphic motor factor as well, with a renewed visual stimulus working favourably for those who wrote the words *correctly* from memory after exposure, and unfavourably for those who did not.

v. *The Fourth Method Employed for Improving the Spelling.*

The teacher of the class, a young man fresh from Training College, now raised an objection to the Head Master's procedure. He favoured a frankly open appeal by a combined visual, auditory and motor-articulatory stimulus. He

thought the Head Master's method was too predominantly visual and that he himself could do better. So the Head Master and he decided to teach for a week against each other. They picked out two lists of words of apparently equal difficulty,[2] and taught each by his own method. They did *not* test the equality of the lists beforehand, as they should have done; but they timed each other's work, and kept each other rigidly to the methods stipulated at the outset. The assistant took the mornings, at 9.45, the Head Master the afternoons, at 2.05. The Head Master taught his 30 words precisely as in the third method, 10 minutes for each of five lessons. The assistant teacher's method was frankly a combined one. On the first day ten words, written on the blackboard, were, one by one, spelt and pronounced once by the teacher and then spelt and pronounced, one by one, twice by the boys in simultaneous work. After that the ten words were spelt through again, twice each, by the boys, without the teacher's example. Then the hardest words of the ten were spelt once again. The weaker spellers then, without the other boys, spelt the words twice. The stronger spellers were now, with their backs to the blackboard, called upon to spell the words, whilst the weaker pupils checked them from the board. Then the weaker boys were also called upon to spell with their backs to the board.

This procedure seems a good deal to get through in ten minutes but the Head Master was checking the time, and it was religiously observed. On the second day the next ten words were dealt with in the same way; and on the third day, the

[2] *List of Words Taught by the Head Master.*

week	ship	soap	Friday	four
minute	whistle	wax	Summer	six
month	salt	candle	Winter	eight
time	iron	silk	holiday	ten
ball	clay	Monday	Christmas	second
hoop	lead	Wednesday	two	fourth

List of Words Taught by the Class Teacher.

day	doll	glass	Thursday	three
year	bat	gas	Spring	five
hour	coal	string	Autumn	seven
night	zinc	paper	season	nine
toy	stone	Sunday	Easter	first
train	gold	Tuesday	one	third

third and concluding ten of the thirty words. On the fourth day—Thursday—the boys spelt and pronounced all the thirty words twice, not after the teacher. This occupied some 4 minutes: the remaining six minutes were taken up by the boys writing down as many of the 30 words as could be done in the time from dictation. On the fifth day all the words were spelled again twice, by the boys, and again the rest of the lesson was given up to dictation.

I need hardly say that these little dictation exercises were not returned marked to the boys; it might have given an undue advantage to the class teacher's method, and would have been costly in time. On the following Monday the two lists were dictated. The average number of words spelt correctly by the Head Master's method was 22.9, and by the assistant's method was 23.0.

The Head Master's method was less laborious in teaching, for he did nothing but pronounce and expose the words; the assistant's method was much more laborious for him. The comparative results were close; each stuck to his own opinion, and in the conflict of argument called upon me to decide. I said that I did not know, but that I would show them how to find out which was the better method. Couldn't I tell, said they, from some mathematical or other analysis of the figures? The answer was in the negative. A consideration of the reasons given will show how we were forced to use the exactly controlled procedure of the First and Second Experiments.[3] First of all, we did not *know* that the two sets of words just employed were equal in difficulty for the class. Secondly, the two methods were taught by two teachers *not* of equal experience and skill. Thirdly, the one lesson did not enjoy quite the same advantage in the placing of the lessons as the other, for one was in the mornings at 9.45, and the other in the afternoons at 2.05. And fourthly, I said, we should have to work with fresh and unsophisticated children; for these Standard I children were, by now, unequally practised; the Head Master's method was too dominant. Then the methods, if we wanted to *prove* anything, should be kept more distinct from each other.

All these conditions were observed; and the researches

[3]Part I. and Part II. of this Research.

directed by me, and called 'A First Experiment' and 'A Second Experiment,' followed.

vi. *Conclusions from the Subsidiary Experiments.*

The outstanding conclusion is of course the need for *controlled procedure with exact measurement.* Point by point, by the logic of events, teachers who try these issues for themselves, are driven along until they reach conditions of experimenting which they see for themselves are valid. They cannot usually invent valid experiments, but they can carry them out (with a year or two's practice); and they are admirable critics of what constitutes validity. They come to an *impasse,* and appeal for guidance. This guidance it is the duty of every educational authority to provide. I do not mean that the authority should appoint superior persons to *tell* the teachers what methods to adopt: the superior persons do not really know any more than the teachers do. I mean that *educational psychologists should be appointed who could help the teachers to find out.* Dozens—hundreds of teachers could set to work (under guidance) to *make the science of experimental pedagogy.* The educational psychologist wants no coercive powers: the teachers *will come to him.* And they will hold debates among themselves, each describing his own experiments, and criticising those of others. Mere talk will be at a discount, and the men and women who can *prove* good methods will come into their own. Is this a mere ideal? Oh no, it is what freedom of method to teachers and encouragement to them to experiment will inevitably lead to.

To return: from the *subsidiary experiments* the combined method seems likely to prove the better for these children, but the imperfections of procedure drive us on to the controlled procedures of the First and Second Experiments. The subsidiary experiments illustrate genetically the pathway to experimental pedagogy.

vii. Summarized Conclusions from Part I and Part II of the Research.

The 'Subsidiary Experiments' preceded the 'First' and 'Second' Experiments in order of time. From them we were driven on to the more carefully controlled experiments known

as 'First' and 'Second.' As far as anything was indicated by the 'Subsidiary' experiments, they showed a balance in favour of methods with combined stimuli and directed attention. But the children who did the work were of low grade (Standard I) and very young (from 7 to 8 years of age), and it is a commonplace of pedagogy that young and mentally undeveloped children require external stimuli to direct and maintain their attention to an extent which their elders do not. With Standards II and IV, children ranging from 8 to 11 years of age in the same school, however, similar results were obtained. The method with pronounced auditory and articulatory factors, as well as visual ones, and with more direction of attention by the experimenter, showed itself definitely superior to a method more purely visual and with less direction of attention. I do not propose to generalize the results beyond the conditions of the experiment. This method may not be the better for English children, nor for any children of a superior mental type. I am prepared to accept the possibility that children, trained to a greater extent to work by themselves than these children had been, might do better on a visual silent method. I also stress the point that it is *not* recommended that lists of words should be picked out irrespective of their meaning, their orthographical construction, or their occurrence within a graded system of teaching reading. Moreover, we have not disproved the feasibility of success by an indirect or incidental method. But we *have* shown that when new spellings are to be acquired by children of this age and mental type, a method which contributes pronounced articulatory and auditory factors, as well as visual ones, is more successful than a method which depends almost wholly upon the latter.

The question of analytic or synthetic methods of teaching reading and orthography with *very* young children is not raised. This is Senior School work, and in Senior Schools the orthography to-day is almost invariably taught by an alphabetic (not phonic) spelling method of some kind, with visual, auditory, articulatory, graphic stimuli or combinations of these. To teachers in Senior Schools in poor neighbourhoods this research especially appeals.

THE END.

IS MYOPIA INHERITED OR ACQUIRED?

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In text-books dealing with the hygiene of the classroom, we frequently find conflicting statements dogmatically made concerning the causes, conditions, and treatment of myopia. We are told by many authors that myopia is almost invariably present at birth, that it progresses under the influence of unhygienic conditions, that it is the product of civilisation. Some writers maintain that myopia is congenital; others declare that it is acquired during the school-period; some that it is incurable, others that certain forms of it are curable. When we come to the consideration of specific causes, we again face a great divergence of opinion. These text-books, written at different dates, at different technical levels, and from different points of view, usually make no attempt to cover a large portion of the literature, extensive as it is, concerning this topic. It is the intention of this article to bring most of the theories proposed and the conclusions reached as the result of investigations in this field up to the present time to a definite focus and, on the basis of this sort of a summary, to draw the most obvious inductions possible under the circumstances.

To understand adequately a discussion of this nature, a general review of the structure and mechanism of the eye will be of advantage. Externally, the eyeball, resting on adipose tissue beneath and behind it, is partially surrounded by a bony socket. Through the rear of this socket passes the bundle of optic nerve-tissue and blood-vessels that enter the back of the eyeball. The eyeball is moved about in this socket by means of six muscles fastened at one end to the surface of the eyeball not far from its equator, at the other end to the rear part of

the socket about the opening through which the optic nerve and blood-vessels pass. Of these six muscles, four are recti (external, internal, superior, and inferior), *i. e.*, they pull directly back; and the remaining two are oblique (superior and inferior), *i. e.*, the direction of the pull is approximately from the right and from the left. The external and internal recti move the eyeball about the vertical axis (right and left); the superior and inferior recti rotate it about its transverse axis (up and down); while the superior and inferior oblique turn it about its anterior-posterior, or sagittal, axis (up-right, down-left, and *vice versa*). The superior oblique is peculiar in that, while, with the four recti, it is attached to the rear of the socket, it accomplishes its pull in a transverse direction by passing through a loop of cartilage on the nasal side of the eye at a point near the equator. Naturally, all of these muscles always operate in pairs and, very frequently, in combinations of pairs. This fact needs to be recalled when we discuss the theories concerning the cause of myopia with special application to these external muscles.

Normally the eyeball itself is approximately a sphere with a slight bulge of less than a millimeter at its anterior part. It consists chiefly of three coats: on the outside, the heavy, opaque, sclera, becoming transparent in front at the cornea; within this, the less tough, dark, choroid ending in plaits at the ciliary processes; and within this, the retina, covering a little more than one-half of the back portion of the eye. In front of the ciliary processes arises the iris and, at their farthest extremity, the so-called *zonula cilaris,* a circular suspensory ligament which is attached to the edge of the capsule containing the lens. Before reaching the ciliary processes, the choroid curves away from the sclerotic coat. The two membranes are separated in this region by a cushion of striated muscular tissue, the ciliary muscle. Some of its fibers are circular in direction, passing around the lens, and many more gradually become transverse, converging from about a point where the sclera passes off into the cornea, where they are attached to points along the front end of the choroid. The interior of the eyeball is divided into two chambers, separated by the lens with its ligamentous attachment and the iris diaphragm. The

posterior chamber contains the vitreous, and the anterior the aqueous humor. Feeding out of the anterior chamber, in addition to other porous tissue, there are imbedded in the sclera at the place where it passes into the cornea, the canals of Schlemm. The ciliary processes and the rear parts of the iris are also perforated with recesses and canals. This description gives the salient anatomical features which concern us in a discussion of the points in dispute in regard to myopia. The facts can be found described with greater detail in Howell (13, p. 300), Noyes (15, p. 2), Cohn (4a, p. 5), and Hess (12, p. 48).

Concerning the mechanism of accommodation whose function it is to focus the image of an outside object on the retina of the eye, primarily by a change in the shape of the lens, there is practically universal agreement. The explanation offered by Helmholtz in 1853 and based on investigations of Cramer (1851) and Langenbeck (1849)—*v.* Hess (12, p. 266)—is accepted with only minor modifications by most physiologists and ophthalmologists. The focusing is performed essentially by the meridional ciliary muscles (muscles of Brücke), but also, to some extent, by the sphincter muscle (muscle of Müller), and the mode of functioning has lent itself to favorable observation (*v.* Hess 12, p. 254). These muscles in their contraction pull the choroid surface of the ciliary processes toward the axis of the lens, releasing the tension of the zonula and allowing the elasticity of the capsule of the lens to bring about a bulging of its anterior surface and a consequent elongation of its axis. The posterior surface of the lens also becomes somewhat more convex, but because the zonula is attached more toward the anterior surface that portion of the lens suffers the greater change. In the process of accommodation, the front surface of the lens is brought forward, the distance between it and the cornea is reduced, and the pupil becomes smaller.

There are several other hypotheses concerning accommodation, the best known of which are, perhaps those of Tscherning (26, p. 1) and Schoen (20, p. 427). The former believes, and advances facts to prove, in his opinion, that during accommodation the ciliary muscles contract with an opposite result from

that outlined above. They produce, he says, a tension of the zonula, so that the body of the lens is pulled slightly back toward the retina, is pressed against the vitreous humor, and in this manner is caused to become more convex in its anterior surface. Demonstrations are reported to have been made on the eyes of oxen. Schoen has suggested that the posterior part of the eye, including the lens and the rest of the eyeball, acts, under the process of accommodation, much in the manner of an air-filled rubber-ball. When the ciliary muscles contract, the sides of this ball are pulled in around the lens, and the front surface of the lens, confined to its capsule, becomes, under this pull at its equator, more convex. The anterior portion of the eyeball would then assume a bell-like shape with the pupil at the apex of the bell. In many details, both of these theories are considered by most physiologists to be inferior to the explanation given by Helmholtz. Experiments have been performed which appear to refute their suppositions and implications.

The term 'myopia' gets its derivation from one of the symptoms of an acute form of the defect, *viz.* the blinking involved in what Donders (5, p. 1) calls the 'working away' of diffusion circles attendant upon unclear vision. Closing the aperture of the eye by means of the eye-lids gives clearer outline to an otherwise blurred image. Jackson (in Norris and Oliver, 14, vol. I, p. 493) defines myopia as "that condition of the refraction of the eye in which the principal focus falls in front of the retina. It may be due to excessive curvature of one or more of the dioptric surfaces (myopia of curvature); or to the increase in the index of refraction of the nucleus of the lens (index myopia); but commonly it is caused by excessive length of the anterior-posterior axis of the eyeball (axial myopia)." Hess (12, p. 334) says "theoretically myopic refraction can be caused by the following conditions: (1) Too great length of axis of the eyeball. (2) Too great curvature of the cornea. (3) Too great curvature of one surface of the lens or of both surfaces. (4) Too high total refraction-index of the lens occasioned by (*a*) too high a capacity of refraction of the kernel of the lens, (*b*) too low an index of refraction of the rind of the lens, or (*c*) by both. (5) Too high an index of refraction of the cornea or aqueous humor. (6) Too low an index of refrac-

tion of the vitreous humor. (7) Too close proximity of the lens and cornea. (8) Conditions in which more than one of the above are simultaneously operative." He points out that of these the first two are the most frequent causes. Noyes (15, p. 90) agrees with this statement when he says, "There are two kinds of myopia. In the one the refractive power of the media is excessive, while the optic axis is of normal length. In the other and common form, undue elongation of the optic axis is the essence of the error." Bates (2c, p. 1) makes a usual distinction when he defines myopia as "that state of the visual organ in which parallel rays of light meet at some distance in front of the retina. When this displacement of the focus is the result of an elongation of the eyeball in which there is a bulging of the back part of the eye, posterior staphyloma, the myopia is permanent; but, when the myopia is due to muscular action which may increase the curvature of the lens or modify the form of the cornea or elongate the globe of the eye, then the myopia may be considered as functional and curable." The defect was well known in ancient times, and was frequently discussed in connection with the slave-trade where a distinction between *myopia ex natura,* the slight and occasional sort, and *myopia ex morbo,* the diseased condition, was made. Aristotle, long before this, had inquired into two problems connected with myopia: (1) Why short-sighted people blink and (2) why they write a comparatively small script. But it was left to Kepler at the beginning of the seventeenth century to give the correct physical explanation of the phenomena.

Leaving the specific etiology of the defect and passing to the generic, we find our attention at once directed to the controversy on the question of the acquired *vs.* the congenital origin of myopia. On the side of the congenital transmission, we have two possibilities: either the defect may be caused by direct transmission through hereditary channels, or the defect may be caused by intra-uterine conditions. In the first case the tendency to the defect may be inherited in the form of secondary anatomical conditions (diathesis), such as weakness of the choroid, and particularly of the sclera, deformed anatomical structure of the head or socket, *v.* Cohn (4a, p. 51),

Parsons (16, p. 968), Smith (21, p. 1162), Fuchs (9, p. 758); or again the immediate conditions which ordinarily give rise to myopia may be inherited *en bloc, v.* Risley (14, p. 362), Steiger (22b, p. 229), Barrington and Pearson (1, p. 42). Many authors are divided in opinion as regards the inheritance of some aspects or forms of the defect. Cohn (4a, p. 93) after citing verdicts on both the acquired and the inherited characteristics of myopia, concludes "that the question of the heredity of myopia is not yet decided; that the transmission of the tendency of myopia is at least highly probable, but that in very many cases, without any hereditary predisposition, myopia is developed by other causes." Steiger found, in 95 instances of actual family disposition to myopia, 70 cases that could be directly traced to hereditary influence, with a marked increase in degree and in earliness of appearance from generation to generation. As the generations were traced, myopia seemed to appear earlier at each step, *v.* Hess (12, p. 349). Barrington and Pearson, who have gathered and tabulated numerous statistics of school children in connection with the London Eugenics Laboratory, claim that myopia and myopic astigmatism, together with other visual defects, are inheritable (1, p. 47). "Without laying any stress on these special numerical values, I think we may take it that they generally confirm the previous conclusion: that the physical characteristics of the eye are hereditary qualities, and that the intensity of inheritance is probably exactly the same as that for other physical characteristics in man." Not only do these investigators believe that their statistics prove this point, but they have gone a step farther to show that environment, in the form of number of people in the same room, physical condition, health, and moral condition of parentage, is a negative factor in increasing the defects of vision, so that (1, p. 55) "normal vision is on the whole *slightly* associated with overcrowding, bad economic conditions, and morally defective parentage." A statistical investigation which leads us to a diametrically opposite conclusion is quoted by Gullstrand (10a) in the 3d edition of Helmholtz's *Optik*. As the result of a systematic examination of school children by Widmark (27) in Sweden, Gullstrand emphasizes the marked decrease of myopia with the hygienic

improvement of conditions in the schools of that country, and hopes that Germany will ultimately learn the lesson and abandon the use of Gothic type and cramped penmanship in its schools. Risley takes the position, on the strength of observations during a long period of ophthalmological practice that, while the parents of myopic children may not suffer from myopia, they very often suffer from other visual defects such as astigmatism and hyperopia or a combination of both, *v.* Norris and Oliver (14, vol. II, p. 358). Erismann (7, p. 1) found that myopia was inherited in 30 per cent. of the cases investigated, but his results are disputed by Nagel and others. Eversbusch points out the effect of inbreeding on the transmission of visual defects. He believes that the appearance of myopic conditions during school life and especially during adolescence is to be explained on the ground of poor local nourishment at the part affected and of improper physical development (8, p. 14). These conditions can be produced by inbreeding, and at any rate are frequently traceable to family relations (*ibid.*, p. 13).

The authorities who hold to an intra-uterine cause of myopia have very little evidence to prove their point, and, in fact, the data are difficult to obtain. The literature devotes little space to this view and Parsons (16, p. 968) only mentions it as a possible cause. The matter figures more as a logical possibility and implication whenever narrow formations of the skull are spoken of, *v.* Hess (12, p. 344). But there seem to be as many indications that large skulls, especially skulls which involve a large distance between the pupils of the two eyes, are responsible for myopic conditions. The supposition would agree more satisfactory with the 'convergence theory' to be considered below. This sort of a formation would again be attributed, of course, to uterine conditions, *v.* Barrington and Pearson (1, p. 4).

But, while some writers are not very definite as to how much emphasis should be laid on the inheritance of the tendency or diathesis to the defect, and how much of a rôle can be assigned to environmental conditions toward developing that predisposition to the defect, by far the greater number put stress on acquisition from the environmental agencies. The majority

of these believe that attending to work with comparatively small objects near at hand is the direct cause of myopia. The notion is, naturally, an old one. Myopia was attributed in the middle of the 17th century to *legere minuta superflue* by F. Plempius. But if we seek specific causes for the defect, we shall find a host of different ones given. The most important of these, however, can be arranged under six headings which follow:

1. *Intraocular pressure.* It is believed by Erismann (7, p. 1) and others, *v.* Hess (12, p. 338) that during the process of accommodation, the lens and the anterior parts of the choroid are pulled in and partly back toward the retina with the effect of increasing the pressure of the vitreous humor. Since the eyeball is enclosed in a system of musculature about its equator, and is not so confined back of the fundus, the posterior portions are pressed out, eventually elongating the eyeball and, in extreme cases, causing *staphyloma posticum,* or atrophy of the choroid about the optic nerve, *v.* Cohn (4a, p. 43). Besides advancing the theoretical argument against this supposition that such a state of affairs ought to be much more prevalent among hyperopic cases because the process of accommodation is naturally more frequent in this condition when the lens is normally near infinity-focus than in myopic cases, Hess has shown conclusively (12, p. 244) that under the act of accommodation the lens becomes free to move to a greater extent than before, so that when the normal eye is accommodated for a near point, the lens falls slightly down out of the line of the axis, when the head is moved downward. More than this, the lens actually is seen to shake (*schlottern*) with the head under the act of accommodation. From this Hess concludes that the lens must exert very little pressure on the vitreous humor. In this connection it should be borne in mind that movements of the interior parts of the eye are to some extent provided for by the system of canals and recesses about the ciliary processes and the iris which absorb the humors and provide for nourishment of the interior tissues.

2. *Turgescence.* It is claimed by Risley and other ophthalmologists that the bending of the head over one's work brings about the congestion of blood-vessels in the eye with the result

that under certain conditions, *e. g.*, weak tissues, the coats of the eye give way and thus change the refractive index of the instrument. Risley says (in Norris and Oliver, 14, p. 364): "Careful and repeated studies of individual cases as noted above have demonstrated that, for these cases certainly, tender, readily yielding, sclera of youth had distended under the strain, and the probable increase of tension, produced by the prolonged turgescence of the intra-ocular tunics, thus bringing about the observed increase in the refraction." Many ophthalmologists suggest this sort of an hypothesis when they speak of eye-strain, *v.* Gould (10, p. 1) and Dresbach (6, p. 17). Emphasis is placed by these writers on the complications set up in the functioning processes of nutrition and blood-circulation, when eye-strain affects the eye. Very often practitioners say that when a myopically astigmatic eye is corrected for astigmatism, myopia itself is reduced. Gould dwells on the strain reflexly caused by the differences of adjustment between the two eyes, and Risley declares that many myopic eyes have grown out of astigmatic conditions.

3. *Convergence.* The effect on the shape of the eyeball caused by continued use of the muscles of convergence is a matter which frequently comes up for discussion, *v.* Burgerstein and Netolitsky (3, p. 870). It was for a long time assumed that these muscles contributed as a class to the ultimate elongation of the eyeball, since they lay at the sides (equator) of the eye and by jerking continually could force the opposite parts of the eye against the corresponding muscle of the same pair. A. v. Graefe and his followers went so far as to favor tenotomy for relieving myopia, and thousands of operations were actually performed with this end in view. Some ophthalmologists still firmly believe that these muscles largely contribute to the establishment of myopic conditions (Bates, 2 b, p. 1), but the assumption that all kinds of myopia are traceable to this cause would not have much foundation. There are too many other conditions, such as refractive errors in the dioptric media themselves, which could not be explained directly from this cause.

4. *Orbital configuration.* Stilling (23, p. 37) is known as the originator of the notion that myopia is, in a large percentage

of cases, due, not to the effect of all of the muscles of convergence (because for anatomical reasons this would be impossible), but to the effect of the superior oblique and in particular to the position in the orbital socket of the cartilaginous pulley through which it passes. This muscle is in especial use in reading. If, therefore, the pulley is too low in the socket, the superior oblique will wind abnormally about the equator of the eyeball and thus press upon and elongate it. This might eventually favor unusual catabolism of the interior tissues and cause, through increased pressure, a separation of the fundus.

5. *Accommodation-cramp.* Iwanoff, in 1869, discovered that in many cases of myopia the ciliary muscles of accommodation were, on *post mortem* examination, abnormally developed. From this finding and from other inferences, many authorities conclude that myopia of a certain kind is produced by abnormal contraction of the ciliary muscles. But, as Bates (2 b, p. 10) points out, this state of affairs is caused directly by improper and unsuccessful efforts on the part of the accommodation-muscles, and to some extent also on the part of the entire external musculature, to see distant objects, after the eye has been habituated to nearby objects. This type of myopia is called *functional* in contrast to the permanently deformed conditions found in some eyes. To quote (2 b, p. 8): "It was interesting to note that these same individuals (patients with emmetropic or normal refraction under atropine) always produced myopic refraction, usually greater in the horizontal meridian, while making an effort to see distant objects; when an effort to see near always produced the opposite refraction, hypermetropia, and greater in the same meridian, the horizontal." He claims that, by a process of re-educating to see distant objects successfully, he has absolutely cured a large percentage of cases of functionally myopic school-children out of a total of about 10,000, and has materially improved the remainder.

6. *Optical nerve-tension.* The Hasner-Weiss theory (Hess, 12, p. 347) assumes that with the movement of the eyeball in the act of convergence there is a slight but perpetual torsion or tension of the optic nerve which gradually pulls

the fundus back and ultimately separates it from the other tissues, producing thus the permanently diseased condition found in some cases. This tension would be greatly enhanced if the optic nerve happened to be abnormally short. Stilling retorts that out of 200 sections of the eye he found relatively few short optic nerves.

A word about the frequency of myopia. Jäger in 1861 claimed that 78 per cent. of all new-born children were myopic. This percentage was gradually reduced by other investigators who used atropine to cancel the effect of the muscles of accommodation to 10 per cent., 3.4 per cent., 2 per cent., and more recently 0 per cent. Hess (12, p. 332) admits wide variations at birth due to maladjustment of the muscles of accommodation, admits also that in part myopic conditions are present in the greater curvature of the cornea, but concludes that the axis of the eye is relatively longer at birth. He quotes, among others, Herrnheiser's figures derived from the examination of 11000 eyes to the effect that at birth there is 0 per cent. myopia and emmetropia, and 100 per cent. hyperopia, while at 75 years there is 20 per cent. myopia, 30 per cent. emmetropia, and 50 per cent. hyperopia. Risley, from the data of an examination of a large number of school-children (18, p. 1) in Philadelphia, gives the following figures: at 8.5 yrs. of age there is 4.27 per cent. myopia, 7.01 per cent. emmetropia, and 88.11 per cent. hyperopia; while at 17.5 yrs. of age there is 19.23 per cent. myopia, 12.28 per cent. emmetropia, and 66.84 per cent. hyperopia. Erismann, in an investigation of 1245 school-children in St. Petersburg, found that in the lowest (1st) grade there was 13.6 per cent. myopia, 18.6 per cent. emmetropia, and 67.8 per cent. hyperopia; while in the highest (7th) grade there was 42.8 per cent. myopia, 21 per cent. emmetropia, and 36.2 per cent. hyperopia. In general, these results indicate that on the average there is a gradual increase in myopia, a practical uniformity of frequence of emmetropia, and a decrease in hyperopia; and that throughout life there is a prevalence of hyperopia among the people of those nationalities (Germany, Russia, England, and the United States) where systematic investigations have been carried on.

To sum up the general causes of myopia as briefly stated on the authority of a large number of trustworthy sources, we may say that the question of inheritance *vs.* acquisition of myopia must remain an open one as long as we are permitted to discuss in terms of disposition, tendency, or diathesis. The array of statistical data must in itself be a precarious undertaking as long as our terms are gross, and as long as 'myopia' may mean several different things. 'Myopic astigmatism' is a complicated condition of defective vision. Even myopia is, as we have seen, of various sorts. We have not yet established what are the unit characters involved in myopia, what kind of myopia is inherited. Authorities seem to believe that certain sorts, especially the condition involving *staphyloma posticum,* is inheritable, but we have no facts and no statistics to prove the case. In regard to the generic causes of myopia, it is only possible to state that we get the impression of a variety of influences which may bear on the production of the defect. Since the kinds of specific causes are, according to the best authority, at least seven in number, and since any one of them is adequate to the production of a myopic defect, it is entirely possible in our mind that any one, or a combination of several, of the six generic causes given may be responsible for the condition. The only one which seems to be inadequate, as far as present evidence goes, is the explanation of increased intra-ocular pressure produced by the process of accommodation. It has not yet been shown that the increase of intraocular pressure due to the effect of convergence-muscles, and especially the superior oblique muscle, is not responsible for some of the conditions surrounding myopia of the axial variety. In brief, it is perfectly fair to say that there is not a single explanation given with the weight of authority behind it which is not disputed by an authority of equal weight. Most authorities content themselves with the recognition of a number of possibilities in the way of causes of myopia. Most of the important ones we have presented, and we must wait for the future to decide which ones, if any, to reject, and which ones, if any, to accept and add.

While, therefore, the scientific literature of today does not allow us to assume an unequivocal position in regard to the hereditary or environmental causes of myopia, yet the opinion of reputable ophthalmologists persuades us to believe that both types of causes have a share in the initiation and development of functional myopia. It is generally stated that if there is a diathesis present toward some form of functional myopia, too close application to work and undue strain on the eyes may operate as a precipitating factor toward myopic conditions. So that, however much we may be impressed by the statistics in regard to the inheritance of myopia, the facts so far advanced do not seem to be conclusive enough to warrant the discontinuation of our present campaign for better school conditions, especially at that age (about adolescence) when statistics show the greatest frequency toward myopia. And, above all, there ought to be some systematic testing of the eyes of school-children to detect the presence of myopia in its incipient functional stages and to prevent its further development.

Even if there is diathesis toward myopia present, hygienic conditions will operate to prevent that tendency from becoming effective in the production of myopia. If, for instance, there is an inherited tendency toward weak tissues, the avoidance of unnecessary close work involving muscular pressure on the eyeball, or the prohibition of an incorrect sitting posture inducing turgescence in these tissues, may make toward unfavorable conditions for the acquisition of myopia.

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COMMUNICATIONS AND DISCUSSIONS.

INEXPERT BINET EXAMINERS AND THEIR LIMITATIONS.

At the Fourth International Congress on School Hygiene the Binet tests were severely criticised on the ground that inexpert examiners who can do only "mechanical" Binet testing are, by the use of the tests, diagnosing children as "normal," "backward," and "feeble-minded." It has seemed to me that it were more just to attack these *examiners* and lay the fault at their door rather than to condemn the tests. It is, of course, to be regretted that the Scale is suffering under the use to which it is being put by persons who attempt to draw conclusions which their knowledge and experience do not warrant, just as it is also to be regretted that many inexperienced nurses incorrectly interpret thermometric readings, although in such cases we blame the nurse and not the thermometer. It has, of course, often been said, and cannot be too strongly emphasized, that to determine the normality or abnormality of children one must be expertly versed in more things than Binet testing. But in the hands of experts the Binet Scale is easily the best (though not the only) means yet devised for the intellectual examination of children, and indeed in their hands can safely be relied upon to diagnose about 90 per cent. of all cases, the remaining 10 per cent. to be subjected to other tests and criteria. It should therefore be urged that those who are capable of doing good Binet testing of the mechanical sort without being clinical psychologists should report the findings of their examinations of children or groups in tables of related chronological and mental ages and not in terms of normality or abnormality. In their reports they can say with a high degree of certainty that those children who show an intellectual retardation of more than 3 years are feeble-minded, but they should not say that those who test less than 3 years retarded are backward or normal. In these lesser degrees of retardation only the expert is capable of evaluating the details of a Binet test with any finality as to either diagnosis or prognosis. Some of the 'backward' and even a slight percentage of the 'normal' children will prove feeble-minded as soon

as they have added a few years to their chronological ages, for even the little that we already know about the intellectual development of the feeble-minded tends to show that some do develop nearly normally up to a certain point and then suddenly cease to increase in mental ability, and that others develop under a constant, but slight, retardation at each year. Of these two types the former will test normal until he reaches his limit of development and will then abruptly cease to progress, whereas the latter shows at each year a constantly increasing degree of backwardness up to the point at which he ceases entirely to develop. In these cases even the expert may do well to postpone any positive diagnosis, and, as Fernald recommends, "wait at least two years" before coming to a decision.

There is, however, one type of Binet examiner who may be qualified as well as, and sometimes better than, a clinical psychologist to make these delicate differentiations. I allude to that class of trained assistants who may not have had technical psychological training through formal studies, but whose extended experience at institutions for mental defectives has given them such thorough acquaintance with feeble-minded children that in giving a Binet test they intuitively *sense* distinctions that would escape the more astute examiner of greater knowledge but less experience. Examiners of this sort are not to be classed with those who have neither technical nor experiential knowledge of the proper use of the Binet Scale, whose information has been gleaned from a Binet pamphlet or from occasional observations of testings, or even from only their own practical use of the tests.

To return for a moment to the method of reporting results: at present there seems to be no other satisfactory way of reporting the results of Binet examinations than by stating both the chronological and the mental ages of the cases examined. Stern (W. Stern; *Die psychologischen Methoden der Intelligenzprüfung*, Leipzig, 1912, p. 55) recommends the use of a 'mental quotient' to express the relationship. He proposes to divide the mental age by the chronological age and let the resulting numerical quotient be the expression of the degree of the mental developmnt of the child in question. I do not believe, however, that this assists us materially, and, indeed, it may be quite misleading. Binet asserts, and our experience confirms him, that when an individual shows a mental retardation of more than 3 years he is undoubtedly feeble-minded, and that even 2

years retardation below the age of 9 is indicative of permanent mental defect. It therefore is of relatively little significance that a child is 5, 6, 7 or more years retarded, since the defect does not become more serious as the child becomes older. Furthermore, there might be all grades of mental defect finding expression in the same quotient. Thus, for instance, a 4-year old idiot of 2 years mentality, a 10-year old imbecile of 5 years mentality, and an 18-year old moron of 9 years mentality would all have the same mental quotient of .50. And, still further, this quotient would be continually changing for a given individual without there being any change whatsoever in the mental capacity of that individual. Our 10-year old imbecile would always have the same mentality of 5 years, whereas his mental quotient would be continually decreasing until, to take an extreme case, at the age of 100 years he would have the absurd quotient of .05. The mental quotient, then, is valuable only when the cases under consideration are all of the same age.

E. A. DOLL.

Vineland, N. J.

ABSTRACTS AND REVIEWS.

ERNEST BURNHAM. *Two Types of Rural Schools.* New York: Teachers College, Columbia University, 1912. (Contributions to Education, No. 51.)

Dr. Burnham's thesis is a social survey and comparative study of a district in Northwestern Ohio that has consolidated schools with a district in Western Michigan that does not have consolidated schools. Facts were gathered and subjected to an elaborate statistical treatment, showing the economic resources, the common community activities, the family life, and the status of the schools in the two districts. The chapter devoted to a consideration of the schools presents tabulated material on (1) the relative economic and administrative phases; (2) the relative academic, professional and social qualifications and activities of the teachers and supervisors; (3) the relative attendance, activities, progress and occupations of the pupils, and (4) a summary of relative facts of a still more general educational nature. The concluding chapter gives a critical and rational interpretation of the data, together with several important, but tentative constructive criticisms. These criticisms relate to the problems of and the administration of schools in such districts; to the types of teachers selected by such communities; to the character of the instruction offered; to the relative retardating and eliminating influences, and to the possibilities for a wider institutional and social service possessed by the consolidated school.

Aside from the facts gathered and the conclusions reached, such a study as this is of value in that it supplies a thoroughly scientific method of work that can be employed in making other surveys. We shall not have thoroughly trustworthy facts until the study has been duplicated. However, Dr. Burnham must be given credit for having pointed the way and for having used the "survey method" in a new field of education. Without doubt there is no phase of public education about which we know less than rural education. It is an open, an inviting and fertile field.

LOTUS D. COFFMAN.
School of Education,
University of Illinois.

CHARLES DE GARMO. *Aesthetic Education.* Syracuse: C. W. Bardeen, 1913. Pp. 161.

"This book maintains that every child should acquire in school a first-hand aesthetic view of the world, as he now acquires an intellectual or a moral view of it. Our present aesthetic teaching is defective in several particulars: First, in that it is left to specialists alone; second, because, in consequence of this fact, it covers only a part of the world that is beautiful; and, third, because it tends to lead the pupil to look for beauty only at second hand, as in pictures of things rather than in the things themselves. The first requisite in giving the pupil this first-hand view of the beauties of the world is that the teacher should acquire it himself. To this end, the book attempts to give a direct, non-technical analysis of the meaning and expression of the beautiful as seen in nature and the arts. It shows how and where to look for beauty, not alone in pictures and statues, but also in nature and the domain of mechanics and of the arts that pertain to daily living. The second requisite is that the teacher should be able to impart the canons of good taste to the pupil, to lead him to see beauty wherever it exists, to distinguish the pretention of beauty from its reality, and to found and reinforce his appreciation by efforts at artistic creation, in drawing and music, to be sure, but also in language and in those every day arts that enhance the pleasures of life."

This quotation from the preface of this delightfully refreshing plea from the pen of Prof. De Garmo calls attention to a serious condition in our public schools—the great need of arousing the sentiment for the beautiful in every day life. It is not primarily a book for "teachers of art," but rather for the teachers of language, science, history, manual training, etc., and its principle mission is to inspire and arouse those who deal with commonplace facts to perceive and reveal the beauty which is in them. C. E. S.

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EDITORIALS.

THE PSYCHOLOGY OF HIGH-SCHOOL LATIN.

Those who are anxious to see subject-matter and methods of our schools arranged with some regard for the tenets of educational psychology will read with interest, whether they agree or not with all its statements, the recent very stimulating report on "The Reorganization of Secondary Education" (Bulletin 551 of the U. S. Bureau of Education). The following paragraph is worth quotation here:

"If Latin is to maintain the high place which it has occupied in our scheme of education for so many generations, the teaching of it must be more vital. In content, scope, and method our courses must be adapted to the ability and to the interests of the children. We have been too busy trying to fit the children to the subject, rather than the subject to the children. Some of the tenderest-hearted of our guild have padded and smoothed the Procrustean bed a little here and there, but it is the same old bed upon which we force our victims to lie. If the subjects of our ministrations writhe and groan, we take their sufferings as evidence that our methods are effective, fortifying ourselves with the assurance that Latin is a 'disciplinary' subject, and that 'all chastening seemeth for the present to be not joyous but grievous, yet afterward it yieldeth peaceful fruit unto them that have been exercised thereby.' We have set an arbitrary standard of attainment and have selected our subject-matter with an almost incredible indifference to the psychology of adolescent girlhood and boyhood."

For one who has passed through some half-dozen years of Latin and nearly as many of Greek it is peculiarly difficult, after the lapse of a score of years, to estimate just what is left in the realm of knowledge or mental efficiency to show for this labor; nevertheless, the writer, for one, would wish that he had endured his chastening in some other bed, perhaps of biological or at least of scientific form. A little more thorough disciplining in modern languages could doubtless also have been endured to advantage. And speaking of 'discipline,' can one resist the thought, heretical as it sounds, that perhaps, after all, the efficiency of those who manage to go through the mill is more than nine-tenths native ability, ripened by Nature's own process of growth?

Again, may it not be that he who attempts to adapt the "content, scope and method" of Latin to fit high-school children may in the end find himself in the position of a man who, to get a better tool for writing, replaces a damaged fountain pen with a new nib, a new barrel and a new cap, one after the other, and then wishes he had bought a typewriter? G. M. W.

AN INTRODUCTION TO THE ELEMENTARY COURSE IN PSYCHOLOGY.

There has just come to the writer's desk an outline of Prof. Bingham's beginning course in psychology. In this is found a device which Dr. Williams and the writer have used with most excellent results for the last two years. It consists in requiring the class to read a chapter a day in Angell's *"Chapters from Modern Psychology"* during the first seven or eight class periods. This book gives a readable and serviceable survey of the scope of psychology. The reading is paralleled by lectures illustrating intensively some aspect of the field of psychology under discussion. Prof. Bingham announces the following lectures to parallel the chapters: (1) General psychology: the psychology of studying. (2) Physiological psychology: the nervous system and its elements. (3) Physiological psychology: the James-Lange theory of emotions. (4) Experimental psychology: combination tones. (5) Abnormal psychology: dreams and hypnosis. (6) Individual and Applied psychology: types of imagination. (7) Social and Racial psychology: the music of primitive peoples. (8) Abnormal: the mental life of a dancing mouse. (9) Genetic psychology: the Binet-Simon tests.

This year our paralleling lectures ran as follows (Chapter I being omitted as not being adapted to the purpose): (1) Physiological psychology: the nervous system and its elements, illustrated by lantern slides. (2) Experimental psychology: measurement of tonal hearing. (3) Abnormal psychology: the retarded child. (4) Individual psychology: Helen Keller. (5) Social psychology: man as a social being. (6) Animal psychology: "Clever Hans", illustrating animal intelligence. (7) Genetic psychology: the meaning of infancy.

Following these seven or eight exercises one class period is devoted to an examination (review) on the reading—not on the lectures. In a three-hour course throughout the year this three weeks' introduction is effective. It is our experience that after this preliminary the student has a serviceable knowledge of what psychology is about and has developed a desire for the work before him. The expense of the book can be simplified by placing a sufficient number of copies on the reference shelves, since it is to be read such a short time.

C. E. S.

NOTES AND NEWS.

In reply to an editorial inquiry regarding newspaper accounts of the Dartmouth Freshmen Tests, the following note has been supplied by Professor Bingham:

"The tests of members of the freshman class which are being made by the psychology department at Dartmouth College are really much less pretentious than the constructive imagination of certain student reporters has led the metropolitan press to suppose.

The measurements being made utilize first of all the series of association tests standardized for the American Psychological Association by Woodworth and Wells. The purpose is to gather norms regarding associative processes in students of college age, and to ascertain which of these various association tests correlate most closely with abilities measured in other ways. The simplicity and the convenience of these tests under working conditions proves the skill and care with which they have been standardized.

"Among the other tests being used are tests of immediate memory for auditory digits and for sense material; tests of sensory discrimination with lifted weights; and tests of ingenuity, which include two simple puzzles and a 'form-blindness' test, so called, devised by Mr. A. S. Osborn,* the legal expert on handwriting and questioned documents. The only motor tests included are the tapping test with the right hand only, and endurance of grip, as standardized by Whipple.

"In the rest periods of the tapping test, the experimenter gleans some information from the freshman regarding his intended vocation, his chief interests and aptitudes in and out of school, his relative scholarship rank in preparatory school, and his use of tobacco. About two hours is required to complete the series.

"The practice of giving psychological tests to freshmen, for many years followed at Columbia, is apparently spreading to many col-

*Cf. Case and Comment, Vol. 19, pp. 800-807.

leges. A certain amount of co-operation and collaboration between institutions would multiply the value of the returns from this work. The feasibility of such co-operation will be one of the questions discussed at an informal round-table conference on 'Mental Tests of College Students' which will be held at the time of the meeting of the American Psychological Association in New Haven, December 29-31."

Under the direction of Professor J. Carleton Bell the entire freshman class at the University of Texas, numbering almost 800, was recently given a series of nine mental tests. These tests were based on the ones suggested by Professor Thorndike in his vice-presidential address before Section L of the American Association for the Advancement of Science, at Cleveland, last winter, with certain modifications to enable them to be given as class tests. They included cancellation, addition, association of word with figure, recognition memory, selective judgment, two forms of the Woodworth and Wells directions test, alternatives, and the Terman form of the Ebbinghaus completion test. The results are now being tabulated and will be reported later.

A Psychological Clinic has been established as a branch of the Psychological Laboratory in the State University of Iowa, with Dr. R. H. Sylvester as clinical psychologist. The clinic is in close co-operation with the medical school and the department of education, and reaches out into the public schools of the state. The clinical psychologist accepts invitations from the schools to spend three days at a time in examining selected groups of children. From such examination a certain amount of clinical material is gathered and great service is done by directions for medical care and home treatment and the way is paved for the introduction of the work of the consulting psychologist in the school systems of the state. In the treatment work of the clinic Dr. Sylvester and his assistants will specialize on speech cases.

The Board of Education of the City of New Orleans has recently established a department of educational research, and has appointed as director of the department Dr. David Spence Hill, formerly of Tulane University. The work that Dr. Hill is undertaking is of a threefold nature: (1) A vocational and educational survey of the city preparatory to the establishment of the Isaac Delgado Central Trades School for boys, to which Mr. Delgado recently bequeathed

nearly a million dollars. (2) A continuance of the study of individual cases of exceptional children according to the general procedure devised last year. This general procedure involves actual co-operation in every case of parent, teacher, medical inspector, physician specialist, social worker, and psychologist, each of whom turns in written reports, and all the data are summarized by the director. (3) Statistical studies concerning elimination, retardation, and repeating. A fuller account of certain phases of this work will appear in a subsequent issue.

Mr. W. A. Maddox, who has been associate professor of education and principal of the training school at the State Normal School, Farmville, Virginia, has left that institution to take charge of the training school in the Oswego Normal School. Mr. T. R. Garth, who has been doing graduate work at Columbia, comes into the department of education at Farmville, and Mr. J. M. Lear, head of the department of history at Farmville, takes the principalship of the training school. The Training School of the State Normal School, Farmville, Virginia, opened this year in its new building. This building was constructed to include all the requirements of a modern public school and also the needs of a training school. It is the result of five years of study and planning.

Dr. W. F. Book, state director of vocational education in Indiana, has inaugurated some interesting investigations preparatory to carrying out the new vocational education law recently enacted by the state legislature. These investigations are along three lines: (1) A vocational survey of the state is being made to ascertain the vocations and professions that are open to the young people of the state. An effort will be made to determine: (a) The opportunities presented by each, wages, hours of labor, chances for promotion, etc. (b) The nature and character of the work, its effect on the health of the worker, dangers, moral condition of occupation, degree of transiency or permanency of work, etc. (c) Kind and amount of preparation needed and cost of same in time and money. (d) Opportunities for receiving the necessary training for these vocations and professions, etc. (e) The facilities for vocational education and guidance in the state.

(2) A standard card is being worked out upon which will be kept a record of a pupil's special interests, his success with different types

of school work, and such other facts about his home conditions, mental and emotional traits, special talents and interests, as would enable teachers and parents to give valuable help in advising a boy or girl in the choice of an occupation or profession.

(3) An expert is to be secured to devise, verify and standardize tests that might be used by superintendents and principals to detect marked ability in brighter pupils in the field of art, music, mechanical manipulation, constructive work, science, business, invention, etc., so that these gifted pupils might early be given the opportunity of developing their special talents and capacities.

At the University of Missouri, the University Elementary School, in charge of Professor J. L. Meriam, has just issued a very artistic and attractive booklet containing many photographs of the children at work in the rooms of the new building, and setting forth the aims and methods of instruction. The public school curriculum is a vexed question at present. Professor Meriam has for years been working on a course of study which omits all specific reference to reading, writing, spelling, arithmetic, geography, and the like, but which centers the school work about the acitivities of the child and brings in the ordinary school subjects incidentally. How this is done is well set forth in the booklet.

At the meeting of the New York State Teachers Association, held at Syracuse, November 25, Professor Guy Montrose Whipple, of Cornell University, read a paper before the normal school and training class section on "The Status of Educational Psychology in the Normal Schools of New York State."

At the meeting of the Texas Teachers of Philosophy and Psychology, held in conjunction with the State Teachers Association at Dallas, November 29, Dr. L. W. Sackett, of the University of Texas, read a paper on the sequence of subjects in psychology, in connection with which he presented a chart showing the sequence of subjects and the number of pages devoted to each in fifteen of the leading textbooks of psychology. Professor J. Carleton Bell discussed "Class Experiments in Educational Psychology."

CURRENT PERIODICALS.

(In this section only such articles will be noticed as bear directly or indirectly upon the interests of this Journal.)

THE ELEMENTARY SCHOOL TEACHER. Vol. XIII, No. 5, January, 1913. GEORGE KOEPPEL. *Observations Concerning the Organization of Schools and Certain Phases of Educational Work in Germany. II. Special Help Schools.* 229-238. A clear and succinct account of the organization of auxiliary schools for backward and feeble-minded children in various parts of Germany. Pupils who are greatly behind their mates in school work are transferred to these special schools for economy of the time and strength of the regular teachers, and for efficiency in dealing with the backward pupils. The chief characteristics of these schools are a reduced course of study and special adaptation to the needs of the pupils. *III. Reform of School Systems.* 287-293. Deals with devices in German schools to take better account of the mental and physical capacities of individual pupils. The author describes the Sickinger plan at Mannheim and the continuation schools in Berlin.

No. 7, March, 1913. S. A. COURTIS. *The Reliability of Single Measurements with Standard Tests.* 326-345, 486-504. A reply to the criticisms of Otis and Davidson (noted in this JOURNAL, Vol. IV, p. 57). The variations in practice effect of twenty-five trials of the addition test are not due to change in readiness of association, but to other factors chiefly neuro-muscular. Averages of large groups show high correlation between test 7 and the sum of tests 1-4, but individual pupils may stand high in one and low in the other. In the first trial of a test the attention is more on the arithmetical phase of the work than in any subsequent trial. The articles present new material comparing the scores obtained in test 1 with scores in column addition. This shows wide individual variation in different types of column addition. The function, "ability to add," turns out, therefore, to be a highly complex affair, and calls for further study and analysis. On the pedagogical side we need more definite aims for our work in arithmetic, and we should have diagnostic tests to indicate the difficulties individual pupils have in attaining these aims.

SCHOOL REVIEW. Vol. XXI, No. 2, February, 1913. GUY WHEELER SHALLIES. *The Distribution of High School Graduates after Leaving School.* 81-91. The author tabulated the marks of 735 high school students who graduated from 75 high schools of New York State in 1908, and studied these marks with reference to the pupils' subsequent history. By far the largest group (34%)

entered college, and these pupils were distinctly above the average in class standing. The other groups, as normal school, professional school, teaching, business, trades, and home, draw their numbers largely from the middle and lower thirds.

CALVIN N. KENDALL. *The Training of High School Teachers.* 92-102. The demand for high school teachers is increasing faster than the supply, and the problem of their training grows acute. Four types of training are discussed, (1) academic training, in which colleges need closer touch with high schools, (2) special courses in education, to which we have to look more and more for the training of teachers, (3) the observation of teaching, which may be of great or of little value, depending upon the kind of teaching observed and the way in which the observations are acted upon, and (4) practice teaching under expert supervision, which is the most important and valuable of all.

No. 4, April, 1913. C. B. ROBERTSON. *The Training of Secondary School Teachers.* 225-234. An account of the course for the professional training of high school teachers offered by the School of Education of the University of Pittsburgh. Special emphasis is laid upon the organization of the practice teaching. The plan would seem to be more elaborate and extended than that to be found in any other institution in this country.

DANIEL STARCH AND EDWARD C. ELLIOTT. *Reliability of Grading Work in Mathematics.* 254-259. A geometry examination paper written by a high school pupil was exactly reproduced, and a copy was sent to the head teacher in methematics in each of 180 high schools with the request that it be graded and returned. The marks on the 138 returns varied from 25 to 90. The authors make an interesting analysis of the variations, and point out the absurdity of assuming that teachers' evaluations of mathematical work will show greater agreement than their judgments in any other kind of work.

No. 5, May, 1913. WALTER F. DEARBORN. *The Practical Results of Recent Studies in Educational Statistics.* 297-306. Present educational practices should be evaluated before radical changes are made in educational procedure, and such evaluation calls for statistical treatment of data already available. The author reports the results of recent studies made under his direction comparing the class standing of the same pupils in the elementary school, in the high school, and in college. From these studies it would appear that pupils maintain in surprisingly large numbers the relative rank with which they began their school work. Changes due to school training do not overbalance differences in native mental ability. Such studies are of value in disclosing maladjustments of different stages of school work, and of different departments of study.

STEPHEN S. COLVIN. *The Practical Results of Recent Studies in Educational Psychology.* 307-322. The teacher has a two-fold task. On the one hand it is incumbent upon him to secure the establish-

ment of certain habits, to mechanize certain mental processes, and to reduce the conscious direction of certain activities. On the other hand he must develop in the pupil the tendency and the ability to act in the light of reflective consciousness, rather than in terms of imitation and habit. Some educators condemn drill, but recent studies have shown its indispensable place. Requisites of good drill are careful preparation, variety in presentation, small number of new elements at each practice period, and a limited and carefully determined time of practice. In habit formation knowledge of the factors involved, favorable affective attitude, and objective standards of progress facilitate the desired results. Habits are largely specific and there is little transfer of training. Learning by wholes, short and frequent periods of study, memorizing by active recall, and singleness of purpose are important conditions of economical learning. In the higher thought processes the results of investigation are less definite, but some tentative conclusions may be advanced: (1) We think clearly only when confronted by a problem. (2) A negative command is more apt to arouse reflection than a positive one. (3) A check or shock to the habitual flow of ideas serves to awaken more vital imagery. (4) A problem not only arouses thought but determines the direction of the trend of thought. (5) In developing intellectual and emotinal attitudes the art of questioning is of vital importance. (6) The teacher should endeavor to maintain an attitude of reasonable self-criticism.

ERNEST C. MOORE. *Improvement in Educational Practice.* 323-333. An appeal for better-trained teachers, a broader outlook upon the problems of teaching, a more careful study of the mental attitudes of pupils, and a better adaptation of methds to individual needs.

PUBLICATIONS RECEIVED.

ADELA MARION ADAM. *Plato. Moral and Political Ideals.* Cambridge Manuals of Science and Literature. New York: G. P. Putnam's Sons, 1913. Pp. viii, 159. Forty cents, net.

An attempt to trace the development of Plato's moral and political ideals through their various stages,—"a clear account, intelligible to the plain man, of what Plato did in the moral and political sphere."

GUSTAV ASCHAFFENBURG. *Crime and Its Repression.* Translated from the German by Adalbert Albrecht. The Modern Criminal Science Series. Boston: Little, Brown & Co., 1913. Pp. xxviii, 331. $4.00 net.

"In its thoroughly realistic application of social statistics to the theories of criminal law, this work occupies a place of almost unique importance in the literature of criminal science. It presents an original treatment of the entire subject—the Repression of Crime—which may well serve some day as a model for a work based on American statistics,—if reliable ones shall ever become available."

RICHMOND L. BISHOP. *The Philosophy of Natural Science.* Boston: The Christopher Press, 1913. Pp. 87.

So far as one may discover from this book the author knows little of philosophy and less of natural science. The book seems to be written to promulgate a particularly crass type of mental healing, and abounds in such statements as the following: "The concordant atmosphere of mind to mind operates upon the natural law of like attractions, or the positive element as master of the negative temperament."

C. S. BLEUMEL. *Stammering and Cognate Defects of Speech.* Volume I. *The Psychology of Stammering.* Pp. x, 365. Volume II. *Contemporaneous Systems of Treating Stammering.* Pp. v, 391. New York: G. E. Stechert & Co., 1913. $5.00 net.

It is interesting to note how needs that are widely felt in the scientific world exert their quiet but steady pressure upon thoughtful students until the method of satisfying these needs ripens in the minds of several individuals at about the same time. There has long been a need in English for a scientific treatment of speech defects, and within a year we are offered two excellent treatises on the sub-

ject,—one from the pen of a noted student of experimental phonetics, and the other the present imposing work. Volume I deals with mental types, verbal imagery, the neural basis of speech, the part played by mental imagery in voluntary speech, aphasia, theories of stammering, mental confusion in stammering, and the effect of fear and auto-suggestion upon speech. Chapter seven is especially valuable, for in it the author presents a careful historical survey of the various theories that have been offered for stammering, and develops his own view on the basis of laboratory and questionnaire studies. Volume II gives a digest of the principal systems and methods of treatingg stammering with a critical evaluation of their claims considered from a psychological point of view. The work is scientific, comprehensive, and unbiased, and merits a place in the library of every student of language and of every teacher of oral English.

B. R. Buckingham, Ph.D. *Spelling Ability: Its Measurement and Distribution.* New York: Teachers College, 1913. Pp. 116. $1.25.

This monograph presents an interesting attempt to establish a scale for the measurement of spelling ability, similar to that devised by Thorndike for handwriting and Hillegas for English composition. From a list of five thousand words, each common to two or more spelling books, two hundred and seventy words were selected, in such a way that all were sufficiently common to be in the speaking vocabulary of third grade children, and that most gave enough difficulty in spelling to test the ability of eighth-grade children. From this "Original List" a "Selected List" of one hundred words was chosen according to the percentages of correct spellings in each of the grades, and from this "Selected List" two "Preferred Lists" of twenty-five words each were constructed. In all 8791 children were tested, and the results were arranged on a scale in such a way as to indicate degrees of difficulty and the difference by which one word is more difficult than another. A practical result of the study is to bring to light the fact that there is great lack of knowledge on the part of principals and teachers as to what words are hard and what are easy for children. This in itself may account in large measure for much of our trouble in the teaching of spelling.

George Rowland Dodson, Ph.D. *Bergson and the Modern Spirit.* Boston: American Unitarian Association, 1913. Pp. 296. $1.35 net.

In this interpretation of Bergson's philosophy for the average man the author shows a broad grasp of modern movements in biology, psychology, sociology, and education, and a commendable freedom from theological bias. He is in full sympathy with the endeavor to

work out a system of ethical and religious views which will not be in conflict with scientific thinking, and points to Bergson for the philosophical basis of such a system. The book is one of the sanest and most temperate applications of Bergson that has yet appeared.

FRANCISCO FERRER. *The Origin and Ideals of the Modern School.* New York: G. P. Putnam's Sons, 1913. Pp. xiv, 147. $1.00 net.

The proverb, "The blood of the martyrs is the seed of the church," rests upon a profound principle of human nature, and it is no less true of the blood of those martyred by the Church. We do not know how Francisco Ferrer is esteemed in Spain today, but it is certain that his name would never have had the distinction which is awarded to it throughout the civilized world if it had not been for his execution for the sake of an idea. Even the Spanish Government has now recognized that it killed an innocent man, and has ordered the restoration of his property to his heirs. The things for which Ferrer stood and the reasons for his persecution by the authorities are naively set forth in this little book, the manuscript of which was found among his effects. It should be widely read by those who are interested in contemporary movements in education.

I. E. FINKELSTEIN, A.M. *The Marking System in Theory and Practice.* Educational Psychology Monographs, No. 10. Baltimore: Warwick and York, 1913. Pp. 88. $1.00.

An interesting study of the range of marks in Cornell University. The book contains six tables and twenty-nine charts, which present in graphic form the range of marks in different schools and departments, and in different courses in the same school. Typical distributions taken from high markers and low markers show no similarity whatsoever. The author recommends a five-division marking system with an approximation to the following distribution: Excellent, 3 per cent.; superior, 21 per cent.; medium, 45 per cent.; inferior, 19 per cent.; very poor, 12 per cent.

EBEN W. FISKE. *An Elementary Study of the Brain.* New York: The Macmillan Company, 1913. Pp. vii, 133. $1.25 net.

This is a laboratory manual on the dissection of the sheep's brain, with an introduction on the phylogeny of the brain and a summary in which applications are made to the human brain. It is the hope of the author to smooth the student's path in his approach to this difficult and complicated subject, and to arouse in him such an interest in neurology that he will be anxious to continue the subject and engage in neurological research. The book contains many splendid photographic plates, and a large number of illustrative diagrams.

ABRAHAM FLEXNER. *Medical Education in the United States and Canada.* Bulletin No. 4. New York: Carnegie Foundation for the Advancement of Teaching. 1910. Pp. xvii, 326.

ABRAHAM FLEXNER. *Medical Education in Europe.* Bulletin No. 6. New York: Carnegie Foundation for the Advancement of Teaching. 1912. Pp. xx, 357.

These two monographs furnish the best survey of the present status of medical education that can be had. The monograph on medical education in America revealed the great excess of poorly equipped, struggling schools, founded for purely commercial reasons or in connection with small colleges, and hindering rather than helping the medical profession and the public health. It has already brought about the abandonment of many weak schools, and the amalgamation of others with stronger institutions. The contrast afforded by medical education in Europe is a striking one, and worthy of the reflection of all who are interested in the broader aspects of education.

CHARLES D. FOX. *The Psychopathology of Hysteria.* Boston: Richard G. Badger, 1913. Pp. 437. $2.00 net.

The author gives a complete survey of the major symptoms of hysteria, including disturbances of sense perception, visceral and circulatory derangements, psycho-motor disorders, psycholepsy, alterations of consciousness, multiple personality, amnesia, suggestibility, delusions, and insanity, and discusses the theories that have been offered to account for the disease. The prophylaxis of hysteria according to the author is little more than a sane and well-balanced education.

SIDONIE MATZNER GRUENBERG. *Your Child Today and Tomorrow.* Philadelphia: J. B. Lippincott Co., 1913. Pp. 234. $1.25 net.

Most parents want to do the right thing by their children, but they are too much occupied with other things to have the time to properly inform themselves on the studies that have been made of child nature, and too impatient and thoughtless to make systematic studies themselves. The present book sets forth in attractive form what the author has learned from books and gathered from her own observation in regard to the training of children. The chapters take up such topics as the problem of punishment, flights of the imagination, lying, fears, the law of obedience, training the will, how children reason, work and play, children's gangs and clubs, ideals and ambitions, the truth about reproduction, and the part that heredity and environment play in development.

W. N. Bailmann. *The Elementary Industrial School of Cleveland, Ohio.* Bulletin No. 549. Washington: Bureau of Education, 1913. Pp. 19.

"We need for professional ends and for purposes of general culture much, if not all, of what the school of the usual sort holds high in its tradition. But, in addition to these things or, perchance, in the place of certain phases of them and in different form and distribution, we need . . . . . opportunity and guidance in the development of constructive, inventive, and creative skill and genius in the fields of activity, in which alone the best of each of them can become available."

Carl Hartman and Lewis Bradley Bibb. *First Book of Health.* Yonkers-on-Hudson: World Book Co., 1913. Pp. iv, 155. Thirty-five cents.

It is a matter for congratulation that so much emphasis is being laid upon health and its preservation, and that health teaching is included in the curriculum of each grade. No other subject is at once so practical and so cultural. It is fortunate that young children in the lower grades have such a simple and interesting account of the elements of physiology and hygiene offered them, and that their text is so richly and helpfully illustrated. The quality of paper and the amount of space allowed for chapter headings might have been improved.

Arthur Holmes, Ph.D. *Principles of Character Making.* Philadelphia: J. B. Lippincott, 1913. Pp. 336. $1.25 net.

This is an attempt to apply psychology in its modernized form to the most vital function of the home and the school. Character has its roots deep down in the inherited constitution of the individual, and any thorough study of character making must begin with heredity. The first five chapters of the book, therefore, deal with the psychological and biological bases of character, discussing the nature of character, the attitude of modern psychology toward character, the sources of character, the development of heredity character, and the instincts. But original traits undergo modification in play and habit formation, and the function of each of these in character making receive attention. But character is dependent upon the nature of higher controls, and upon the way in which these controls function in the responses of the individual. Hence we have chapters on the self, the will, the impulses and ideals of youth, and the essence of good character. Finally, by way of a summary of the whole matter, there is a chapter on the psychological basis of moral education.

CHARLES HOOLE. *A New Discovery of the Old Art of Teaching School.* Copied from manuscript in the British Library, with Introduction and Notes by Thistleton Mark. Syracuse, N. Y.: C. W. Bardeen, 1912. Pp. xxxviii, 360. $3.00.

This interesting book gives an excellent picture of English educational theory and practice three hundred years ago. It consists of four treatises, (1) "A Petty School", (2) "The Usher's Duty", (3) "The Master's Method", (4) "Scholastic Discipline". Hoole was perhaps the most painstaking of all the English educational writers of his time, and it is noteworthy that, while the greatest emphasis is laid upon the languages, as Latin, Greek, Hebrew, Chaldee, Arabic, etc., a course was provided for those who did not wish to take up Latin. This was the "Writing Schools" where the pupils were to be taught to keep up their English, to write a fair hand, and afterwards to be exercised in arithmetic and "such preparative arts as may make them completely fit to undergoe any ordinary calling." Great credit is due the publisher for making this work accessible to modern students of education.

THOMAS JOSEPH KIRBY, Ph.D. *Practice in the Case of School Children.* New York: Teachers College, 1913. Pp. 98. $1.00.

A study of the results of practice in arithmetic with 1350 third and fourth-year children in the schools of the Children's Aid Society, New York City. Two sets of practice tests were used, one in addition, the other in division. Various practice periods from two to twenty minutes were employed, and the effect of each distribution of time carefully noted. In both addition and division the greatest gains were made by the groups which had their practice in the shortest periods. After an interval of 12 days there was very little loss in the records of those who had improved 50 per cent. or more, but the summer vacation brought a very considerable loss in both addition and division.

EDWIN GORDON LAWRENCE. *How to Master the Spoken Word.* Chicago: A. C. McClurg & Co., 1913. Pp. ix, 420. $1.50 net.

This book deals with correct breathing, proper voice production, the adequate expression of meanings, improvement of memory, fluency of speech, control of an audience, and the construction of speeches. A considerable part of the book (230 pages) is devoted to extracts from Greek, Latin, and modern orators.

ALBERT H. LEAKE. *Industrial Education, its Problems, Methods, and Dangers.* Boston: Houghton-Mifflin Co., 1913. Pp. xi, 205. $1.25 net.

This volume, by the inspector of technical education in Ontario,

Canada, won the Hart, Schaffner and Marx prize for essays in economics in 1912. Part I gives a brief sketch of the history of industrial education, and develops the problems which are involved in its various aspects. Part II discusses the methods of industrial education, taking up the curriculum and work of the elementary schools, manual training and its needed reorganization, new types of industrial schools, day and evening continuation schools, apprenticeship, and vocational guidance. Part III presents a consideration of some dangers arising from the misinterpretation of foreign systems and their indiscriminate application to American conditions. The book is one of the most scholarly discussions of the subject that is available in English.

C. RIBORG MANN. *The Teaching of Physics for Purposes of General Education.* New York: The Macmillan Co., 1912. Pp. xxv, 304. $1.25.

"The book is divided into three main parts. The first of these traces the development of the present situation. The second traces the origin of physics, and seeks to establish its leading characteristics and to define its possibilities as a means of general education. In the third part the purpose of physics teaching is stated, and hints are given as to how this purpose may be attained." In the last chapter, on testing results, the author advocates the development and use of such scientific tests as have been worked out for arithmetic, handwriting, and English composition, and as have been recently perfected for spelling.

FRANCES JENKINS OLCOTT. *The Children's Reading.* Boston: Houghton Mifflin Co., 1912. Pp. x, 344. $1.25 net.

An excellent survey of the entire field of juvenile literature by the former head of the children's department at the Carnegie Library in Pittsburgh. Among the topics considered in the various chapters are picture books and illustrations; easy reading for young people; fables, myths and fairy tales; ballads, epics and romances; poetry and rhymes; some classics and standards; fiction of today; history, biography and travel; useful books; and religious books. Each chapter contains a discussion of the most important books in the class, and the reasons for considering them of value. Many programs of consecutive reading are outlined. The appendix contains One Hundred Good Stories to Tell, and Where to Find Them, and an alphabetical purchase list of about 800 of the best books for children. The volume will be of great value to teachers and parents in recommending books for their children, and deserves to be widely known and studied.

JOSEPHINE MORRIS. *Household Science and Arts.* Cincinnati: The American Book Co., 1913. Pp. 256.

The author, who is supervisor of household science and arts in the Boston Public Schools, here offers a book for use in the elementary schools that emphasizes clean and sanitary kitchens, adequate kitchen equipment, and the preparation of simple and wholesome food. The illustrations in color are quite attractive and should familiarize pupils with the names for the various cuts of meat.

H. J. MOZANS. *Woman in Science.* New York: D. Appleton & Co., 1913. Pp. xiii, 452. $2.50 net.

The first chapter of this book deals with "Woman's Long Struggle for Things of the Mind", and requires over one hundred pages for the development of the story. In the subsequent chapters the separate fields of science are taken up, and there is a detailed exposition of woman's activities in mathematics, astronomy, physics, chemistry, the biological sciences, medicine and surgery, archaeology and invention. The final chapter considers the future of women in science, and claims for them a considerable share in the advancement of human thought. The book is a scholarly one, and in view of the violent disputes aroused by the feminist movement its appearance is very timely.

RAYMOND W. SIES. *Teachers' Pension Systems in Great Britain.* Bulletin No. 544. Washington: Bureau of Education, 1913. Pp. 88.

One section of a general study of teachers' pensions and pension systems in the leading educational countries of the world.

G. F. WRENCH. *Lord Lister, His Life and Work.* New York: Frederick A. Stokes Co., 1913. Pp. 384. $4.50 net.

One cannot repress a shudder on reading the grewsome results of surgical operations a half century ago,—the loathsome gangrene, the fatal blood poisoning, the hopeless outlook for the patient when any sort of major operation had to be performed. Then came Pasteur with his discovery of the cause of this supporation, the germs found in the dust of the air, and Lister with his aseptic treatment of wounds, and the whole practice of surgery was revolutionized. But before this was brought about, however, Lister had to carry on a long and bitter fight with the entrenched forces of traditional surgical practice, and the story of that fight is graphically portrayed in this book. It is a bit of modern history that should be widely taught in the schools, in order that intelligent men and women may maintain a saner attitude toward the vagaries of faith healing that so abound.

DAVID SNEDDEN. *Problems of Educational Adjustment.* Boston: Houghton Mifflin Co., 1913. Pp. ix, 262. $1.50 net.

This collection of papers, all of which have appeared before in various educational magazines, constitutes another attack upon "things as they are" in education,—an attack by one of the most careful students of the whole field of educational activity, both in its theoretical and in its practical aspects. Of particular value are the first four papers, which deal with the new education and educational readjustment, the new basis of method, what is a liberal education, and why study history?

HENRY SUZZALLO. *The Teaching of Spelling.* Boston: Houghton Mifflin Co., 1913. Pp. xii, 129. Sixty cents, net.

"Up to twenty years ago the characteristic activities of the spelling period were a mere examination of the child's ability to spell and a drilling upon the correct form of misspelled words. Within the last decade the prevention of error, rather than the testing and noting of errors, has become the major activity. Apparently we are now about to devote an increased energy and ingenuity to the weakest spot in the spelling lesson,—the correction of misspellings. We are ready to develop a technique which will adequately correct those misspellings which escape all the anticipatory efforts of our best teachers. It is in the diagnosis of spelling errors and in the skillful substitution of new and correct habits that we shall find our largest immediate opportunity for improving our methods of teaching spelling."

R. M. WENLEY. *The Anarchist Ideal.* Boston: Richard G. Badger, 1913. Pp. 274. $1.25.

"This book consists of five studies: The Anarchist Ideal; Plutarch and his Age; The Progress toward Physiological Psychology; Heredity and Education: Some Facts and Some Guesses; and the University in the United States. These essays, while appealing to the teacher and to the psychologist, have an equally direct message for the American citizen interested in contemporary movements and institutions in the United States."

HENRY SUZZALLO. *The Teaching of Primary Arithmetic.* Boston: Houghton Mifflin Co., 1913. Pp. xi, 124. Sixty cents net.

A survey of current methods of teaching primary arithmetic, and an analysis of present tendencies in method. The various methods are objectively considered, and there is little of the "thou shalt" and "thou shalt not" in the discussion. The treatment takes full account of the modern experimental point of view in studies of method, and the author urges further studies in the psychology of number.

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